



E-ISSN: 2278-4136  
P-ISSN: 2349-8234  
[www.phytojournal.com](http://www.phytojournal.com)  
JPP 2020; 9(6): 741-744  
Received: 14-09-2020  
Accepted: 18-10-2020

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## Effect of post shooting bunch sprays and bunch covers on yield of banana cv. Grand Naine

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### Abstract

The present study entitled “Effect of post shooting bunch sprays and bunch covers on yield of banana cv. Grand Naine” was carried at ICAR- AICRP on Fruits, Kittur Rani Channamma College of Horticulture, Arabhavi, Belagavi district, Karnataka during the year 2019-2020. The experiment was laid out in Split-plot design with two main treatments and six sub treatments. Among the different treatments tested, the bunch spray with 2 per cent sulphate of potash and 0.5 per cent of Arka banana special mixture along with bunch covering (B<sub>2</sub>S<sub>6</sub>) significantly improved bunch weight (22.15 kg), bunch length (98.10 cm), bunch width (50.80 cm) and finger characteristics like weight (163.06 g), length, girth (15.69 cm), peel (36.91 g), pulp weight (127.16 g) and peel to pulp ratio (3.44) followed by bunch spray with 2 per cent sulphate of potash and 0.5 per cent of Arka banana special mixture without bunch covering (B<sub>1</sub>S<sub>6</sub>) over control.

**Keywords:** Arka banana special, banana, bunch covers, post shooting sprays, sulphate of potash

### Introduction

Banana (*Musa paradisiaca* L.) is an evergreen perennial monocotyledonous and monocarpic herb belongs to the family *Musaceae*. It is native to Southeast Asia and it is an important nutrient-rich fruit crop cultivated for local consumption and export in India. It is known as a queen of tropical fruit and also noted as symbol of prosperity, wealth and fertility. Banana is cultivated in more than 120 countries such as India, China, Brazil, Philippines etc., Bananas are predominantly distributed between 30° N and 30° S of equator, where there is a wide seasonal variation in rainfall and temperature (Pua and Davey 2007) [12]. Globally, the leading producers of bananas are India, China, Philippines, Brazil and Ecuador. India contributes more than 20 per cent of global production but has very less (< 0.05%) contribution to the international banana market. India stands third in area (0.87 m ha), first in production (32.60 million MT) and second in productivity (37 MT/ha).

The cultivar Grand Naine (AAA) is a popular variety grown majorly in all the banana growing countries of Asia, South America and Africa. This is a superior selection from Giant Cavendish which was introduced from Australia to India during 1990's and it is a tall mutant of Dwarf Cavendish. Due to many desirable traits like excellent fruit quality, immune to Fusarium wilt. It has been proved as better variety (Singh and Chundawat, 2002) [4, 14].

Among management practices, balanced dose of nutrition including both macro and micronutrients plays a significant role in quality improvement in banana. Use of murate of potash (MOP) as a potassium source results in chloride toxicity, hindering the crop yield and quality. Hence, Sulphate of potash (SOP) is used instead of murate of potash as it improves yield and quality (Nalina *et al.*, 2003) [8]. Sulphate of potash (SOP) as a source of potassium (50%) and sulphur (17.5%) is more useful fertilizer for improving yield and quality. Potassium improves the fruit weight and significantly shortens the time required for fruit maturity (Bhargava *et al.*, 1993) [4]. Next to potassium, sulphur is considered as the fourth important nutrient (Walmsley and Twyford, 1976) [17]. Higher fruit quality, especially higher sugar content is mainly due to the role of K which helps in carbohydrate synthesis, water regulation, translocation and synthesis of protein, and neutralization of physiologically important organic acids (Tisdale and Nelson, 1966) [15].

Micronutrients play a key role in balanced plant protection for increase in yield and quality of banana. These are defined as organic compounds other than nutrients present in small amounts promotes or modify any physiological responses in plants. Banana has been found to report well to the sprays of micronutrient mixture supplied through zinc + iron + copper + boron in proper concentration. (Yadlod and Kadam, 2008) [19]. The deficiency of zinc results in slow

development of bunch and appearance of small twisted light green fingers. Iron promotes chlorophyll production and increased sugar content, intensifies colour and improves flavour of fruit on ripening. Boron is necessary for translocation of sugars and promotes fruit maturity. Where, deficiency of it leads to fruit cracking.

Till now, various materials have been used for bunch covering in banana. Among them, Polypropylene spun bond non-woven fabric bunch cover bag is a kind of agricultural fabric used as a bunch cover in banana. The bunch cover is of 17 gsm UV treated with 1.0 m length, 0.8 m diameter and  $0.18 \pm 0.02$  mm thickness having 20 % water absorption capacity. A protective fibrous white coloured non-woven fabric exhibits sufficient vapour permeability to alter or control the ripening of the banana. In view of possible benefits of sulphate of potash, micronutrients, Arka banana special and polypropylene spun bond non-woven fabric banana bunch covers, the current experiment was conducted.

### Material and Methods

The experiments were carried at ICAR- AICRP on Fruits, Kittur Rani Channamma College of Horticulture, Arabhavi, UHS, Bagalkote, Karnataka, India. The experiment was laid out in a split-plot design with twelve treatments, three replicated. The three plants are selected erratically for noting observations from each treatment. The plants belong to last hand opening stage are selected and tagged mentioning the treatment details. The split-plot design with bunch covering as main treatment and bunch sprays as sub-treatments were taken and the treatments were imposed after last hand opening and denavelling as per the experimental details given below.

### Treatment details

**Main treatments:** Bunch covering

**B<sub>1</sub>** - Without bunch cover

**B<sub>2</sub>** - With bunch cover using polypropylene spun bond non-woven fabric

**Sub-treatments:** Post shooting sprays

**S<sub>1</sub>** - Control (without any spray)

**S<sub>2</sub>** - Bunch spray with 2% SOP (2 sprays at last hand opening and 30 days interval).

**S<sub>3</sub>** - Bunch spray with micronutrient [Zn (1.0%) + B (0.2%) + Fe (0.3%) + Cu (0.2%)] after complete opening of hands and 15 days after 1<sup>st</sup> spray.

**S<sub>4</sub>** - Bunch spray with 0.5% banana special after complete opening of hands and 15 days after 1<sup>st</sup> spray.

**S<sub>5</sub>** - Bunch spray with 2% SOP + micronutrient [Zn (1.0%) + B (0.2%) + Fe (0.3%) + Cu (0.2%)].

**S<sub>6</sub>** - Bunch spray with 2% SOP + 0.5% banana special.

### Treatment combinations

Different yield parameters were recorded and the data was subjected to statistical analysis for meaningful conclusions.

### Results and Discussion

The analysis of data showed significant differences among the different treatment combinations for yield parameters (Table 1 and 2). All the yield parameters were relatively higher in treatment with bunch cover along with post shooting bunch spray with 2% SOP + 0.5% banana special (B<sub>2</sub>S<sub>6</sub>).

**Table 1:** Effect of post shooting bunch sprays and bunch covers on bunch characters of banana cv. grand naine

Treatments	Bunch weight (kg/plant)		Bunch length (cm)		Bunch width (cm)		No. of hands per bunch		No. of fingers per bunch		Weight of 3 <sup>rd</sup> hand (kg)	
B <sub>1</sub> S <sub>1</sub>	17.12		79.13		38.29		7.38		109.97		2.50	
B <sub>1</sub> S <sub>2</sub>	20.75		91.20		46.23		8.40		134.33		3.04	
B <sub>1</sub> S <sub>3</sub>	17.72		82.56		41.23		7.90		117.44		2.54	
B <sub>1</sub> S <sub>4</sub>	19.76		86.81		44.37		8.20		128.00		2.93	
B <sub>1</sub> S <sub>5</sub>	19.03		84.72		43.97		7.54		121.89		2.73	
B <sub>1</sub> S <sub>6</sub>	21.61		95.73		48.83		8.93		141.44		3.22	
Mean (B <sub>1</sub> )	19.46		86.69		43.70		8.06		125.50		2.83	
B <sub>2</sub> S <sub>1</sub>	18.44		79.63		39.74		7.51		114.67		2.71	
B <sub>2</sub> S <sub>2</sub>	21.53		93.82		46.73		8.41		138.66		3.11	
B <sub>2</sub> S <sub>3</sub>	18.81		82.52		41.81		7.94		120.00		2.63	
B <sub>2</sub> S <sub>4</sub>	20.80		89.33		45.51		8.34		131.67		2.96	
B <sub>2</sub> S <sub>5</sub>	19.13		85.82		44.06		7.58		126.00		2.79	
B <sub>2</sub> S <sub>6</sub>	22.15		98.10		50.80		9.24		145.00		3.56	
Mean (B <sub>2</sub> )	20.14		88.20		44.78		8.17		129.33		2.96	
S <sub>1</sub>	17.78		79.38		39.02		7.44		112.22		2.60	
S <sub>2</sub>	21.14		92.51		46.40		8.41		135.83		3.08	
S <sub>3</sub>	18.27		82.54		41.50		7.92		112.55		2.59	
S <sub>4</sub>	20.28		88.07		44.94		8.27		129.50		2.94	
S <sub>5</sub>	19.47		85.27		43.91		7.56		124.44		2.76	
S <sub>6</sub>	21.88		96.92		49.65		9.09		142.83		3.39	
For comparing the means of	S. Em ±	C.D. at 5%	S.Em ±	C.D. at 5%	S.Em ±	C.D. at 5%	S.Em ±	C.D. at 5%	S.Em ±	C.D. at 5%	S.Em ±	C.D. at 5%
Main (B)	0.11	0.33	0.87	NS	0.13	0.40	0.06	NS	0.63	NS	0.02	0.03
Sub (S)	0.21	0.63	0.37	1.09	0.21	0.62	0.09	0.26	1.52	4.48	0.02	0.07
S at same M	0.30	0.89	0.52	NS	0.30	0.87	0.12	NS	2.15	NS	0.03	0.09
M at same S	0.24	1.01	1.27	NS	0.26	0.75	0.11	NS	1.53	NS	0.04	0.10

B<sub>1</sub> - Without bunch cover, B<sub>2</sub> - With bunch cover using PP spun bond non-woven fabric cover, NS - Non significant

S<sub>1</sub> - Control (without any spray), S<sub>2</sub> - Bunch spray with SOP (2%), S<sub>3</sub> - Bunch spray with micronutrient mixture, S<sub>4</sub> - Bunch spray with banana special (0.5%), S<sub>5</sub> - Bunch spray with SOP (2%) + micronutrients, S<sub>6</sub> - Bunch spray with SOP (2%) + banana special (0.5%)

**Table 2:** Effect of post shooting bunch sprays and bunch covers on finger characters of banana cv. grand naine

Treatments	No. of fingers/ 3 <sup>rd</sup> hand	Finger weight (g)	Finger length (cm)	Finger girth (cm)	Pulp weight (g)	Peel weight (g)	Pulp to peel ratio							
B <sub>1</sub> S <sub>1</sub>	12.67	120.68	17.09	12.46	88.77	31.58	2.81							
B <sub>1</sub> S <sub>2</sub>	15.11	154.07	19.56	14.43	117.89	36.18	3.26							
B <sub>1</sub> S <sub>3</sub>	14.00	128.65	18.05	13.30	95.86	32.79	2.92							
B <sub>1</sub> S <sub>4</sub>	14.78	143.20	18.56	14.38	107.93	35.27	3.06							
B <sub>1</sub> S <sub>5</sub>	13.79	135.19	18.06	13.71	101.23	33.97	2.98							
B <sub>1</sub> S <sub>6</sub>	17.22	159.24	21.60	15.47	122.43	36.81	3.33							
Mean (B <sub>1</sub> )	14.59	140.17	18.82	13.96	105.68	34.43	3.06							
B <sub>2</sub> S <sub>1</sub>	12.89	124.22	17.81	12.94	91.95	32.28	2.85							
B <sub>2</sub> S <sub>2</sub>	16.26	156.78	20.46	14.56	120.22	36.56	3.29							
B <sub>2</sub> S <sub>3</sub>	14.93	132.74	18.14	13.26	99.28	33.45	2.97							
B <sub>2</sub> S <sub>4</sub>	15.67	146.52	19.12	14.47	110.58	35.94	3.08							
B <sub>2</sub> S <sub>5</sub>	13.70	139.96	18.67	14.07	105.37	34.58	3.05							
B <sub>2</sub> S <sub>6</sub>	18.70	163.06	22.01	15.69	127.16	36.91	3.44							
Mean (B <sub>2</sub> )	15.36	143.88	19.37	14.17	109.09	34.95	3.11							
S <sub>1</sub>	12.78	122.45	17.45	12.70	90.36	31.93	2.83							
S <sub>2</sub>	15.69	155.42	20.01	14.50	119.05	36.37	3.27							
S <sub>3</sub>	14.46	130.69	18.09	13.28	97.57	33.12	2.95							
S <sub>4</sub>	15.22	144.86	18.84	14.43	109.25	35.60	3.07							
S <sub>5</sub>	13.75	137.58	18.37	13.89	103.30	34.28	3.01							
S <sub>6</sub>	17.80	161.15	21.80	15.58	124.79	36.86	3.39							
For comparing the means of	S.Em ±	C.D. at 5%	S.E m±	C.D. at 5%	S.Em ±	C.D. at 5%	S.Em ±	C.D. at 5%	S.Em ±	C.D. at 5%	S.Em ±	C.D. at 5%	S.Em ±	C.D. at 5%
Main (B)	0.11	0.32	0.04	0.12	0.09	0.27	0.01	0.04	0.01	0.08	0.08	0.50	0.07	0.45
Sub (S)	0.14	0.41	0.07	0.20	0.21	0.63	0.05	0.14	0.04	0.11	0.06	0.17	0.09	0.27
S at same M	0.19	0.57	0.10	0.29	0.30	0.91	0.07	0.20	0.05	0.16	0.08	0.24	0.13	NS
M at same S	0.19	0.56	0.08	0.22	0.22	0.66	0.04	0.13	0.04	0.11	0.13	0.37	0.13	NS

B<sub>1</sub> - Without bunch cover, B<sub>2</sub> - With bunch cover using PP spun bond non-woven fabric cover, NS - Non significant

S<sub>1</sub> - Control (without any spray), S<sub>2</sub> - Bunch spray with SOP (2%), S<sub>3</sub> - Bunch spray with micronutrient mixture, S<sub>4</sub> - Bunch spray with banana special (0.5%), S<sub>5</sub> - Bunch spray with SOP (2%) + micronutrients, S<sub>6</sub> - Bunch spray with SOP (2%) + banana special (0.5%)

### Bunch weight (kg) and weight of 3<sup>rd</sup> hand

The results showed that highest bunch weight (22.5 kg) was recorded in treatment B<sub>2</sub>S<sub>6</sub> and least bunch weight (17.12 kg) was recorded in B<sub>1</sub>S<sub>1</sub> i.e., control. The potassium plays a major role in increasing bunch weight mainly due to its catalytic factor in many biological processes of plant which reflect on the nutritional status of the trees (Baiea *et al.*, 2015) [3]. Presence of Sulphur along with potassium in SOP helps to increase absorption of potassium or it react with nitrogen and potassium as reported by Farrag *et al.*, (1990) [5]. The use of Arka banana special has synergetic effect increasing yield by increasing the cell division and elongation as reported by Pathak *et al.*, (2011) [11] in cv. Martaman (AAB, Silk).

In addition, bunch covers increase 5 to 10 per cent bunch weight by maintaining the temperature of 21- 24°C under bunch cover as reported by Turner and Lahov, (1985) [16].

### Bunch length (cm) and bunch width (cm)

The result showed that the length of bunch was significantly influenced by post shooting bunch sprays. The increased bunch length (96.92 cm) was recorded in B<sub>2</sub>S<sub>6</sub> and least was recorded in B<sub>1</sub>S<sub>1</sub> (79.13 cm). Similarly, the increased bunch width was recorded in B<sub>2</sub>S<sub>6</sub> (50.80 cm) and least was recorded in B<sub>1</sub>S<sub>1</sub> (38.29 cm). The increased length and width of the bunch is due to cell expansion and elongation by the effect of nutrients on RNA and DNA synthesis.

### Number of hands and fingers per bunch

The effect of bunch feeding on number of fingers per bunch and number of hands per bunch in different treatment combinations did not express any significant difference with respect to interaction of bunch covers and post shooting bunch sprays. As the fingers and hand were fully opened during the imposition of treatments.

### Finger weight (g)

Finger weight of banana has significantly influenced by post shooting bunch sprays and bunch covers. Increased finger weight (163.06 g) was noticed in B<sub>2</sub>S<sub>6</sub> while, the lowest finger weight (120.68 g) was recorded in treatment B<sub>1</sub>S<sub>1</sub> (control). The increased weight of fruit is due to rapid multiplication of cells and greater accumulation of sugars or carbohydrates and water in expanded cells after enlargement reported by Rameshkumar and Kumar, (2007) [7, 8] in cv. Ney Poovan. The results are in conformity with those reported by Sandhya *et al.*, (2018) in banana cv. Grand Naine and Nandankumar *et al.*, (2011) [9] in cv. Nanjangudu Rasabale of banana.

### Finger length (cm) and finger girth (cm)

The finger length was significantly influenced by the post shooting bunch sprays and bunch covers. Among the treatments the maximum finger length (22.01 cm) and finger girth (15.69 cm) was recorded in B<sub>2</sub>S<sub>6</sub>. However, the lowest finger length (17.09 cm) and finger girth (12.46 cm) was recorded in B<sub>1</sub>S<sub>1</sub>.

The Sulphur has synergistic effect with zinc, which is essential for the cell elongation by increasing the cell permeability to water and osmotic solutes of the cells (Ahmed *et al.*, 1998). Increased finger length and fruit girth and other finger characteristics due to spray of nutrients can be attributed to its impact on cell development and cell division. The effect of bunch covers as they create the micro environment around the banana bunches might have enhanced physiological and metabolic activities. Similar results are found in findings of Reddy (1989) [13], Weerasinghe and Ruwanpathirana (2002) [18], Mustaffa *et al.*, (2004) [7], Rameshkumar and Kumar, (2007) [7, 8] in cv. Ney poovan and Nandankumar *et al.*, (2011) [9].

**Pulp weight (g) and peel weight (g)**

The pulp and peel weight were differed significantly among the different treatments. The maximum Pulp weight (127.16 g) and peel weight (36.91 g) was recorded in B<sub>2</sub>S<sub>6</sub> and least pulp weight (88.77 g) and peel weight (31.58 g) was recorded in B<sub>1</sub>S<sub>1</sub>. Findings of Kurien *et al.*, (2000) <sup>[6]</sup> in morpho-physiological aspects of finger development, it was found that cell enlargement took place by reducing the available air space followed by starch fillings in the cells in fruit final stage of development.

Increased peel thickness due to multiple enzymatic and catalytic functions used in many metabolic and photosynthetic processes in plants and increased the peel thickness of orange fruit by Omaima and Metwally (2007) <sup>[10]</sup>.

**Conclusion**

Overall, it is concluded that the banana bunches sprayed with sulphate of potash, Arka banana special along with Polypropylene spun bound non-woven fabric bunch covers enhance the yield of banana cv. Grand Naine which attracts the consumers and ensures highest profit.

**Acknowledgement**

I am thankful for the support of all the professors at ICAR-All India Coordinated Research Project on Fruits, Arabhavi.

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